

NOTES ON *ANTROSELATES* HUBRICHT, 1963
AND *ANTROBIA* HUBRICHT, 1971
(GASTROPODA: HYDROBIIIDAE)

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Abstract.—*Antroselates* Hubricht, 1963 and *Antrobia* Hubricht, 1971, monotypic cavesnail genera from eastern United States, are redescribed. The presence of a spermathecal duct in the female reproductive system of these snails indicates that, contrary to earlier opinions, they belong to the Hydrobiidae: Littoridininae. Both genera are well-differentiated members of the *Cochliopina* Morrison, 1946 group, characterized by possession of trochoidal shells and simple penes.

The monotypic genera *Antroselates* and *Antrobia* are poorly known members of the North American aquatic cavesnail (Gastropoda: Hydrobiidae) fauna. Initial descriptions of these unusual-shelled snails lacked critical details from soft-part morphology and speculations on their affinities have varied considerably. *Antroselates*, for instance, was initially considered a hydrobiid (Hubricht 1963:138), but also has been placed in the Micromelaniidae (Taylor 1966: 171, Burch 1982:3). During the course of an ongoing review of North American cavesnails, we examined what may be the only alcohol-preserved material available for these genera and determined that, contrary to all previous assertions, both are well-differentiated members of the *Cochliopina* group of Hydrobiidae: Littoridininae (Hershler 1985). Redescriptions of *Antroselates* and *Antrobia* follow.

Antroselates Hubricht, 1963

Antroselates Hubricht, 1963:138. Type species, *Antroselates spiralis* Hubricht, 1963, by monotypy and original designation.

Diagnosis.—Shell small, solid, trochoid-low conic, with 4.5 rounded whorls sculptured with numerous elevated spiral lines. Protoconch tilted or depressed, with punc-

tate surface lined by spiral grooves. Aperture enlarged, with expanded outer lip. Umbilicus narrowly to broadly open. Operculum paucispiral, with rapidly expanding whorls. Animal blind, unpigmented. Basal cusps of central radular teeth emerging from lateral angles. Cephalic tentacles without hypertrophied ciliary tufts. Ctenidium broad and elongate, with ca. 25 filaments. Intestine with coil in pallial roof. Penis simple, flagellate, non-glandular; surface of distal portion striated. Females oviparous. Spermathecal duct present, connecting posteriorly with albumen gland and anteriorly with capsule gland. Oviduct opening into ventral surface of albumen gland. Bursa copulatrix large, positioned partly posterior to albumen gland.

Remarks.—Placement of this genus in the Micromelaniidae was based on the incorrect observation that the central radular teeth lacked basal cusps (Hubricht 1963:138). We assign the genus to the Hydrobiidae: Littoridininae on the basis of possession of a spermathecal duct in the female reproductive system (see Davis et al. 1982, Hershler 1985). The globose shell and simple penis indicate assignment to the informal *Cochliopina* group (Hershler 1985). Affinity with *Antrobia* is indicated by similarity of protoconch sculpture and duct arrangements in the pallial oviduct complex (including

unique connection between spermathecal duct and albumen gland). These snails are, however, separable by differences in shell, penial and radular morphology.

Antroselates spiralis Hubricht

Figs. 1, 2, 3a–c, 4

Antroselates spiralis Hubricht, 1963:138–139, pl. 8, figs. a, b; (Holotype FMNH 116916).—Burch 1982:108, fig. 108.

Material examined.—Kentucky. Edmondson County: Echo River Spring, Mammoth Cave National Park, USNM 673526 (paratypes), USNM 673527 (paratypes); River Styx, Mammoth Cave, Mammoth Cave National Park, UF 40624 (alcohol series [unrelaxed]).

Description.—Shell (Fig. 1) 4.3–5.2 mm in height, slightly taller than wide. Whorls shouldered adapically, sutures slightly indented. Body whorl enlarged, spire relatively small. Shell white-clear, translucent, with amber periostracum. Surface typically eroded with small holes. Protoconch surface slightly pitted; spiral grooves (Fig. 1d) fairly broad and slightly depressed. Spiral lines of irregular height crossing strong growth lines on teleoconch (Fig. 1b, c). Aperture ellipsoidal, longer than wide, rounded above and somewhat angled below, and tilted relative to coiling axis, with anterior side advanced. Inner lip somewhat thickened and reflected below, broadly adnate to body whorl above. Outer lip thin. Operculum (Fig. 2a) thin, amber-colored, with pronounced growth lines.

Animal of three whorls (Fig. 1b). Proximal portions of tentacles without any externally visible vestiges of eyespots. Generalized formulae of radular teeth (Fig. 4): central, 5(6)-1-5(6)/3-3; lateral, 4(5)-1-4(5); inner marginal, 15–18; outer marginal, 12–16. Central teeth trapezoidal; basal cusps small, central cusps only slightly enlarged. Lateral teeth with enlarged, hoe-like central cusps (Fig. 4b). Stomach slightly longer than style sac. Posterior edge of stomach without

caecal chamber. Intestinal loop filling posterior half of pallial roof (Fig. 2b). Osphradium filling 25–33% of ctenidium length.

Testis (Ts, Fig. 2b) massive, covering stomach and extending from posterior edge of prostate gland (overlapping most of stomach) almost to posterior end of animal. Branches of testis bearing numerous grape-like lobes and draining to narrow, thin vas efferens. Seminal vesicle consisting of a few thickened coils ventral to anterior testis. Prostate gland (Fig. 2d) thickened, near-circular in outline; almost entire length positioned in pallial roof. Vas deferens entering and exiting antero-ventral portion of gland; anterior portion of duct having thickened coil. Penis emerging from behind right cephalic tentacle, large relative to head (Fig. 2c), with a tight clockwise coil. Penis (Fig. 3a) unciliated, vermiform, with short distal-most section tapering gently. Vas deferens having thickened coils in base of penis; duct undulating in penis. Distal half of structure striated (Fig. 3a), with surface consisting of broad ridges alternating with narrow furrows (Fig. 3b). Terminus (Fig. 3c) thickened, smooth. Opening of vas deferens terminal, simple.

Ovary a simple lobed mass filling about one half whorl behind posterior edge of stomach. Albumen and capsule glands (Ag, Cg, Fig. 2e) about equal in length; capsule gland bipartite (posterior section much longer). Oviduct (Ov) with single, thickened coil on left side of albumen gland. Kidney-shaped bursa copulatrix pressed against and slightly overlapping posterior edge of albumen gland. Bursa duct narrow (Dbu). Seminal receptacle (Sr) small, almost ductless, pear-shaped, positioned on left side of albumen gland and slightly overlapping bursa. Oviduct without connection to albumen gland. Communication to latter achieved by short duct emerging from spermathecal duct (Dsd, Fig. 2f) slightly anterior to point where oviduct joins seminal receptacle duct. This unique arrangement implies that oocytes travel (anteriorly) a short dis-

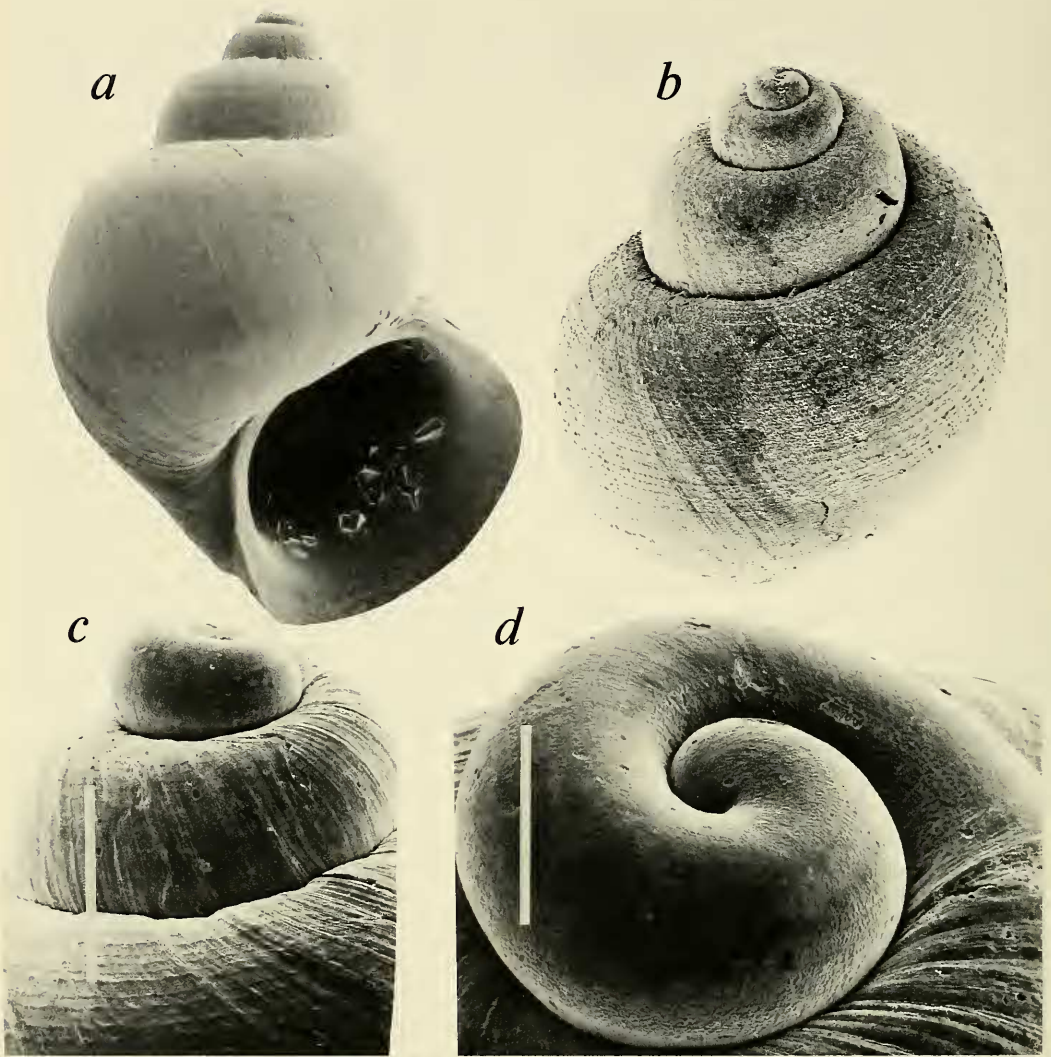


Fig. 1. SEM micrographs of shells of *Antroselates spiralis* Hubricht, USNM 673527 (paratypes): a, (Shell height, 4.95 mm); b, Dorsal aspect, showing well-developed spiral lines (shell height, 3.12 mm); c, Apical whorls (bar = 0.43 μm); d, Protoconch (bar = 176 μm).

tance through the spermathecal duct before entering duct to albumen gland. Spermathecal duct (Sd) fairly wide, pressed against capsule gland. Spermathecal duct entering anterior capsule gland; genital aperture (Ga) simple, terminal.

Distribution.—Found in a few caves and springs in vicinity of Mammoth Cave National Park, Kentucky, as well as in a cave stream in adjacent Indiana (Fig. 5; Hubricht 1963). Snails “found on the undersides of

large stones in running water” (Hubricht 1963:139). The species was not found by the senior author during a 1987 trip to the Mammoth Cave area.

Antrobia Hubricht, 1971

Antrobia Hubricht, 1971:95. Type species, *Antrobia culveri* Hubricht 1971, by monotypy and original designation.

Diagnosis.—Shell small, low conical,

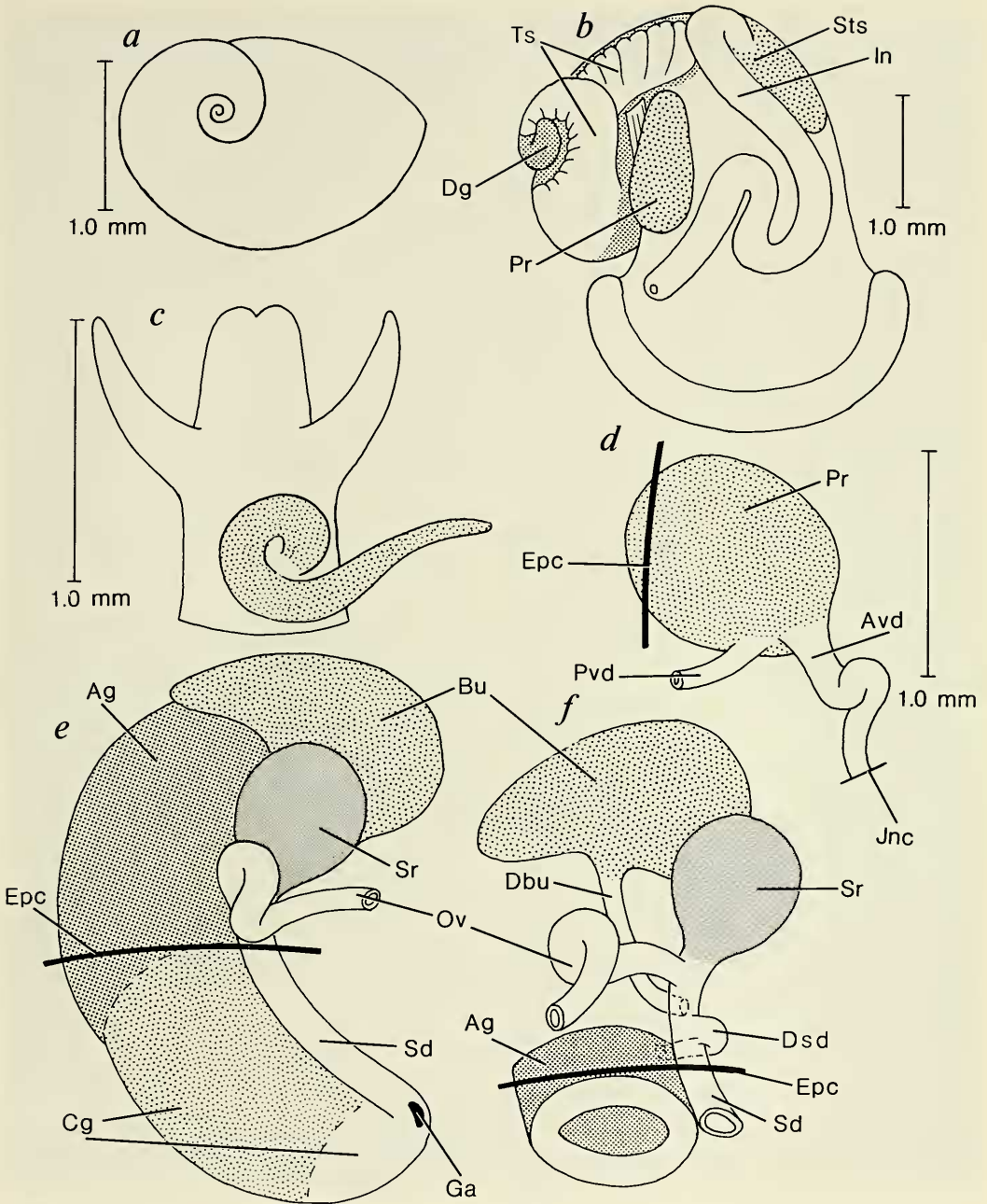


Fig. 2. Morphology of *Antroselates spiralis* Hubricht, UF 40624: a, Dorsal view of operculum; b, Dorsal view of male (head-foot removed); c, Dorsal view of head and penis; d, Right lateral view of prostate gland; e, Left lateral view of pallial oviduct complex; f, Left lateral view of bursa copulatrix, seminal receptacle (rotated to expose underlying structures), and associated ducts. Only the anterior portion of the albumen gland is shown. Ag = albumen gland; Avd = anterior vas deferens; Bu = bursa copulatrix; Cg = capsule gland; Dbu = duct from bursa copulatrix; Dg = digestive gland; Dov = duct connecting oviduct and spermathecal duct; Epc = posterior end of pallial cavity; Ga = genital aperture; In = intestine; Jnc = juncture between anterior vas deferens and "neck"; Ov = oviduct; Pr = prostate gland; Pvd = posterior vas deferens; Sd = spermathecal duct; Sr = seminal receptacle; Sts = style sac; Ts = testis.

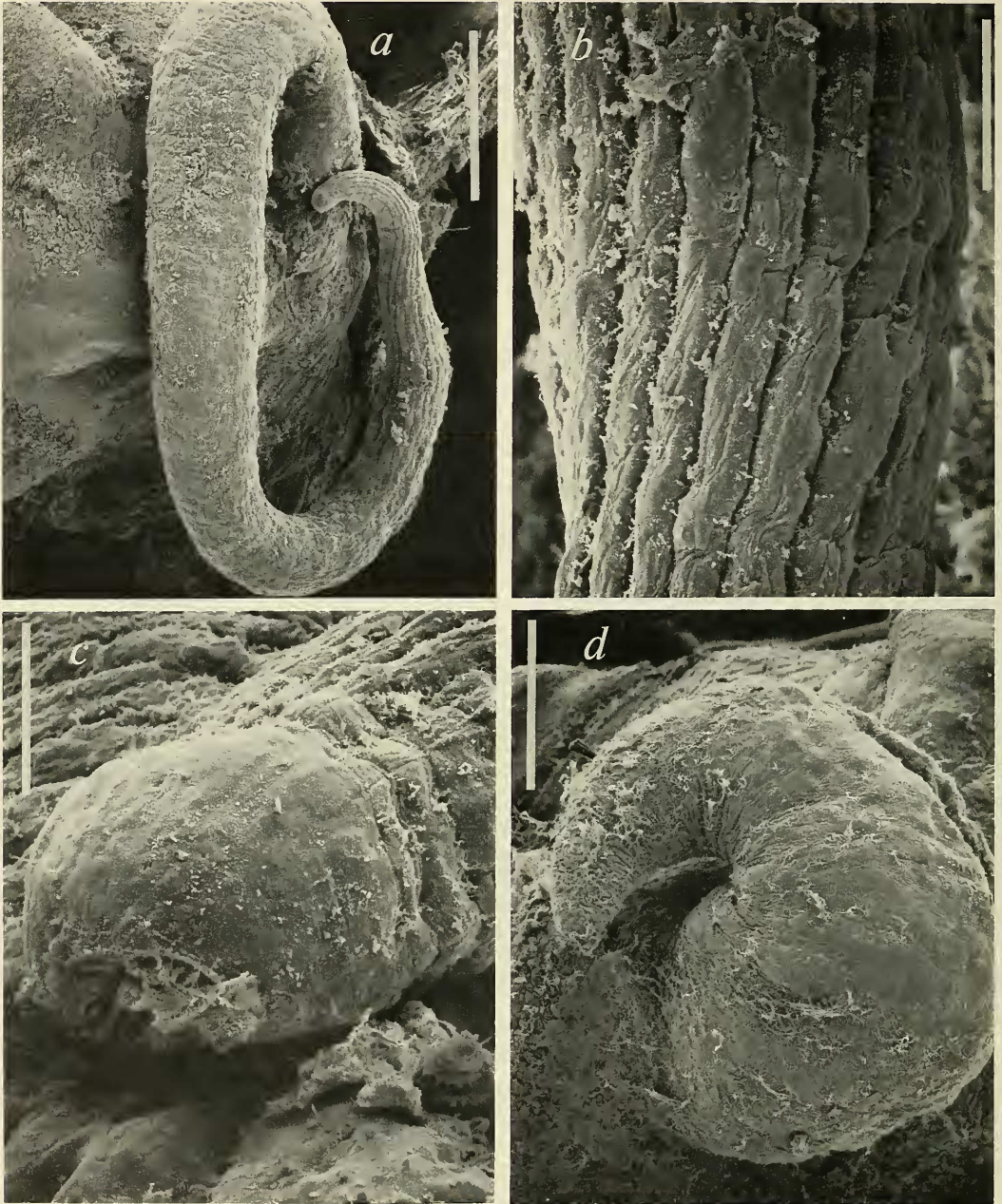


Fig. 3. SEM micrographs of critical point dried penes of *Antroselates spiralis* Hubricht, UF 40624 (a-c) and *Antrobia culveri* Hubricht, LH coll. (d): a, Dorsal view of penis (bar = 37 μm); b, Close-up of striated surface (bar = 213 μm); c, Close-up of penial tip, showing simple terminal opening (bar = 25 μm); d, Dorsal view of penis showing irregular ciliation (bar = 136 μm).

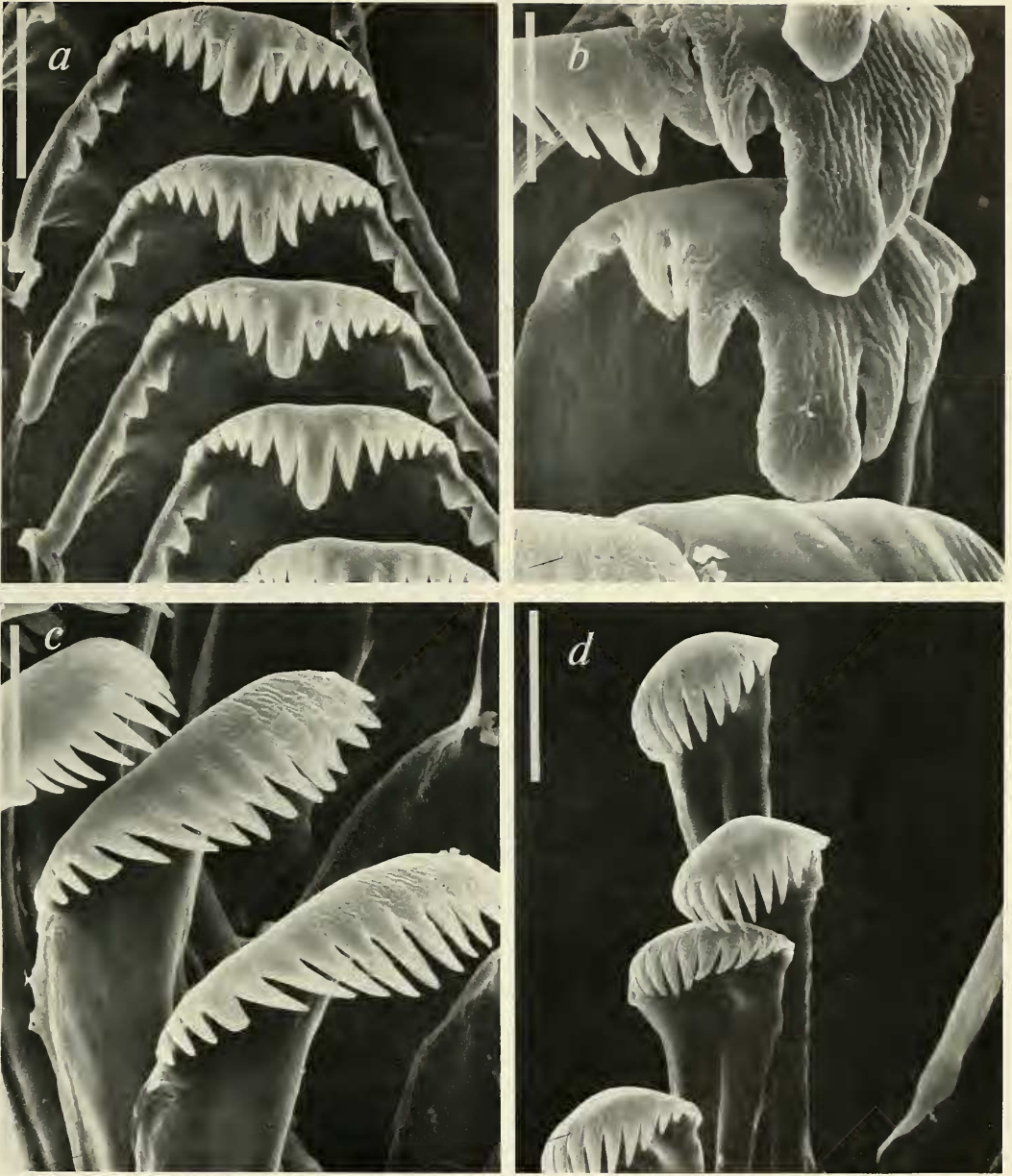


Fig. 4. Radula of *Antroselates spiralis* Hubricht, UF 40624: a, Centrals (bar = 17.6 μm); b, Laterals (bar = 12 μm); c, Inner marginals (bar = 13.6 μm); d, Outer marginals (bar = 15 μm).

broadly umbilicate, with 3.5 well-rounded whorls having indented sutures. Protoconch and teleoconch lined with regularly spaced shallow spiral grooves. Aperture simple, sub-circular. Operculum multispiral, with slowly expanding whorls. Animal blind, unpig-

mented. Cusps numerous on all radular teeth; central teeth broadly trapezoidal with elongate lateral angles. Cephalic tentacles without hypertrophied ciliary tufts. Ctenidium reduced, consisting of ca. eight small filaments. Penis simple, non-glandular, dag-



Fig. 5. Drainage map of eastern United States showing distributions of *Antroselates spiralis* Hubricht and *Antrobia culveri* Hubricht.

ger-like. Females oviparous. Spermathecal duct present, connecting posteriorly with albumen gland and anteriorly with capsule gland. Bursa copulatrix positioned partly posterior to albumen gland.

Remarks.—Burch (1982:3) placed this genus in the Lithoglyphinae, presumably based on its low-conical “lithoglyphine-like” shell. Given the presence of a spermathecal duct in the female reproductive system (absent from lithoglyphines; Thompson 1984), these snails are more appropriately placed in the Hydrobiidae: Littoridininae. *Antrobia* is distinguished from other members of the *Cochliopina* group by its radular morphology (similar to that of *Fontigens* Pilsbry, 1933) and teleoconch sculpture.

Antrobia culveri Hubricht Figs. 3d, 6–8

Materials examined.—Missouri. Taney County: stream in Tumbling Creek Cave, 4.5 mi NE of Protem, FMNH 164171 (Holotype), FMNH 164170 (Paratypes); Leslie Hubricht coll. 38780 (alcohol series [relaxed]).

Description.—Shell (Fig. 6) 1.9–2.2 mm high, very slightly taller than wide. Sutures indented. Shell white-clear, translucent, with amber periostracum. Surface typically partly covered by white deposits. Protoconch (Fig. 6d, e) with 1.0–1.25 whorls, having a slightly pitted surface with well-spaced, spiral grooves. Grooves sometimes ending af-

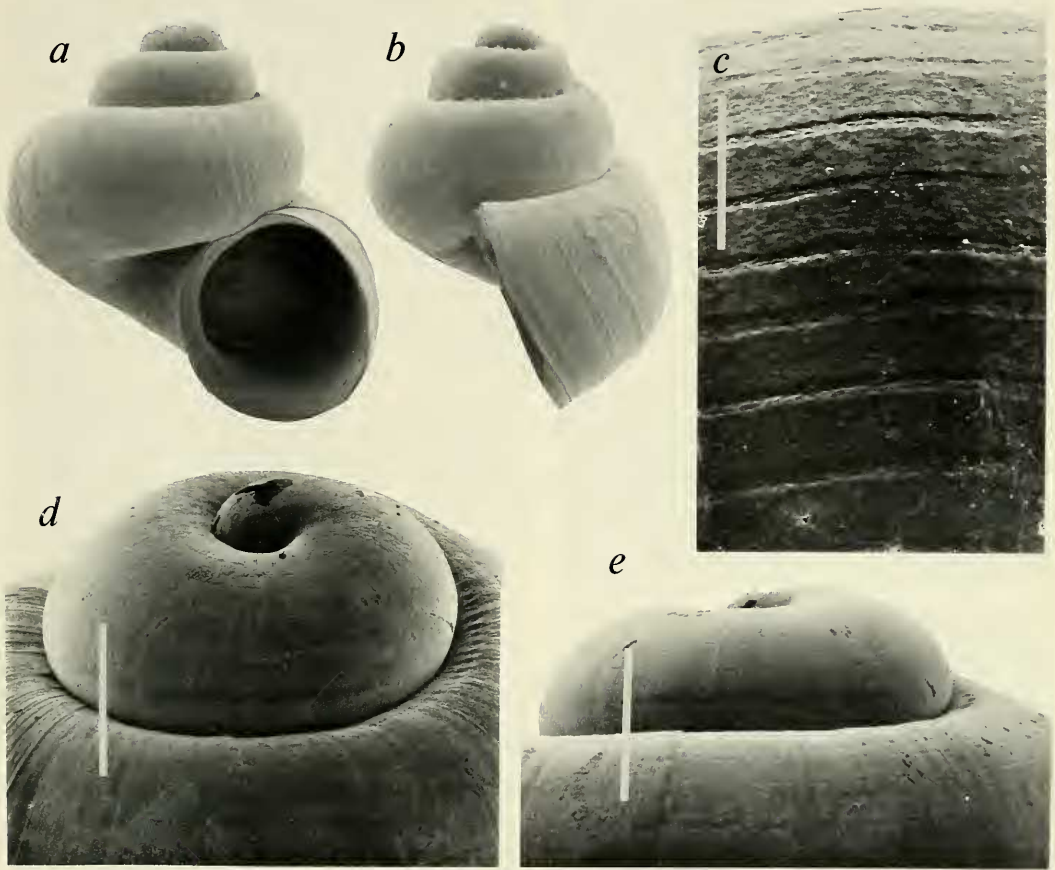


Fig. 6. SEM micrographs of shells of *Antrobia culveri* Hubricht, FMNH 164170 (paratypes): a, b (Shell heights, 1.9, 2.0 mm, respectively); c, Close-up showing spiral grooves (bar = 0.43 μm); d, e, Views of apex (bars = 176 μm).

ter first teleoconch whorl (erosion?). Teleoconch roughened with collabral growth lines. Aperture longer than wide, near-planar, adnate to a small portion of the body whorl above, and slightly tilted relative to coiling axis (adapical side advanced; Fig. 6b). Inner lip reflected, somewhat thickened; outer lip thin. Operculum (Fig. 7a) thin, amber.

Animal of two whorls. Proximal portion of tentacles without any externally obvious eyespot vestiges. Generalized formula of radular teeth (Fig. 8): central, 6(7)-1-6(7)/3-3; lateral, 16-17; inner marginal, 29; outer

marginal, 21. Cusp morphology very similar for all tooth types: note absence of enlarged central cusps on centrals and laterals. Basal portion of central teeth well excavated between lateral angles and basal process. Stomach considerably longer than style sac. Posterior stomach edge without caecal chamber. Intestinal loop undulating gently in pallial roof. Osphradium about 33% of ctenidium length.

Testis a single, unlobed mass, filling one-half whorl of animal and partly overlapping the posterior stomach. No vas efferens not-

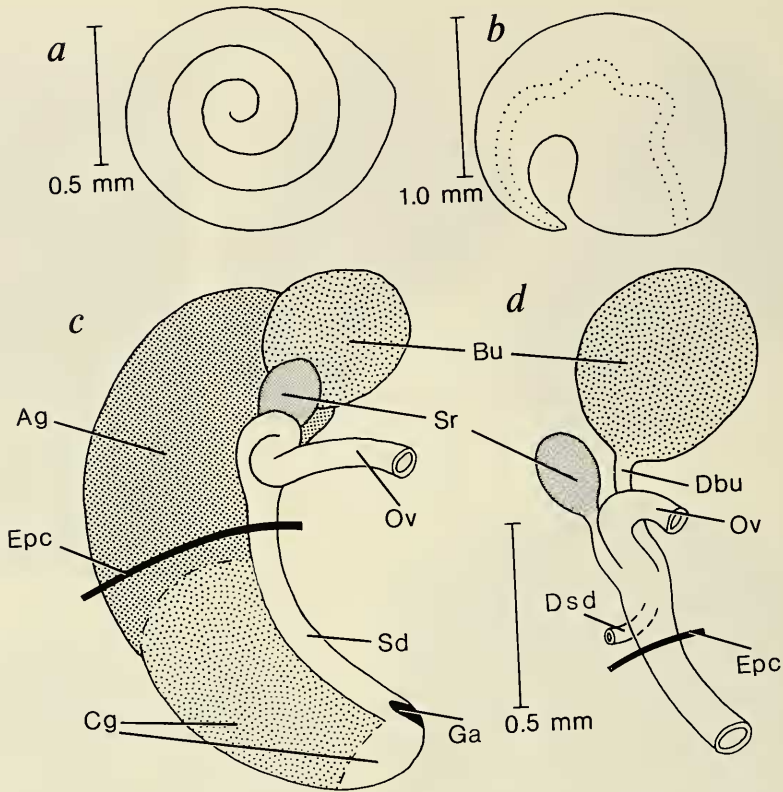


Fig. 7. Morphology of *Antrobia culveri* Hubricht, LH coll.: a, Dorsal view of operculum; b, Dorsal view of penis showing course of vas deferens (dotted line); c, Left lateral view of pallial oviduct complex; d, Left lateral view of bursa copulatrix, seminal receptacle (rotated to expose underlying structures), and associated ducts. Ag = albumen gland; Bu = bursa copulatrix; Cg = capsule gland; Dbu = duct from bursa copulatrix; Dov = duct between oviduct and spermathecal duct; Epc = posterior end of pallial cavity; Ga = genital aperture; Ov = oviduct; Sd = spermathecal duct; Sr = seminal receptacle.

ed; seminal vesicle consisting of a few thickened coils entering anterior edge of testis. Prostate gland small, with 50% of length in pallial roof. Vas deferens entering and exiting central area of prostate. Penis (Fig. 7b) small, with tight clockwise coil, well-tapered. Surface irregularly ciliated (Fig. 3d), with cover particularly heavy distally. Distal end of penis undifferentiated; terminal pore simple. Vas deferens undulating slightly within penis.

Ovary an unlobed mass filling a relatively small portion of digestive gland posterior to the stomach. Albumen gland slightly longer than capsule gland (Ag, Cg, Fig. 7c). Capsule

gland bipartite with posterior section much larger. Oviduct (Ov) with single coil on left side of albumen gland. Bursa (Bu) sac-like, with a narrow duct (Dbu, Fig. 7d). Seminal receptacle (Sr) small, positioned partly anterior to bursa. Oviduct without connection to albumen gland. Communication to latter achieved by short duct emerging from spermathecal duct (Dsd, Fig. 2f) anterior to point where oviduct joins seminal receptacle duct. Spermathecal duct (Sd) moderately wide, pressed against capsule gland and entering gland near anterior terminus. Genital aperture (Ga) simple, terminal.

Distribution.—Endemic to underground

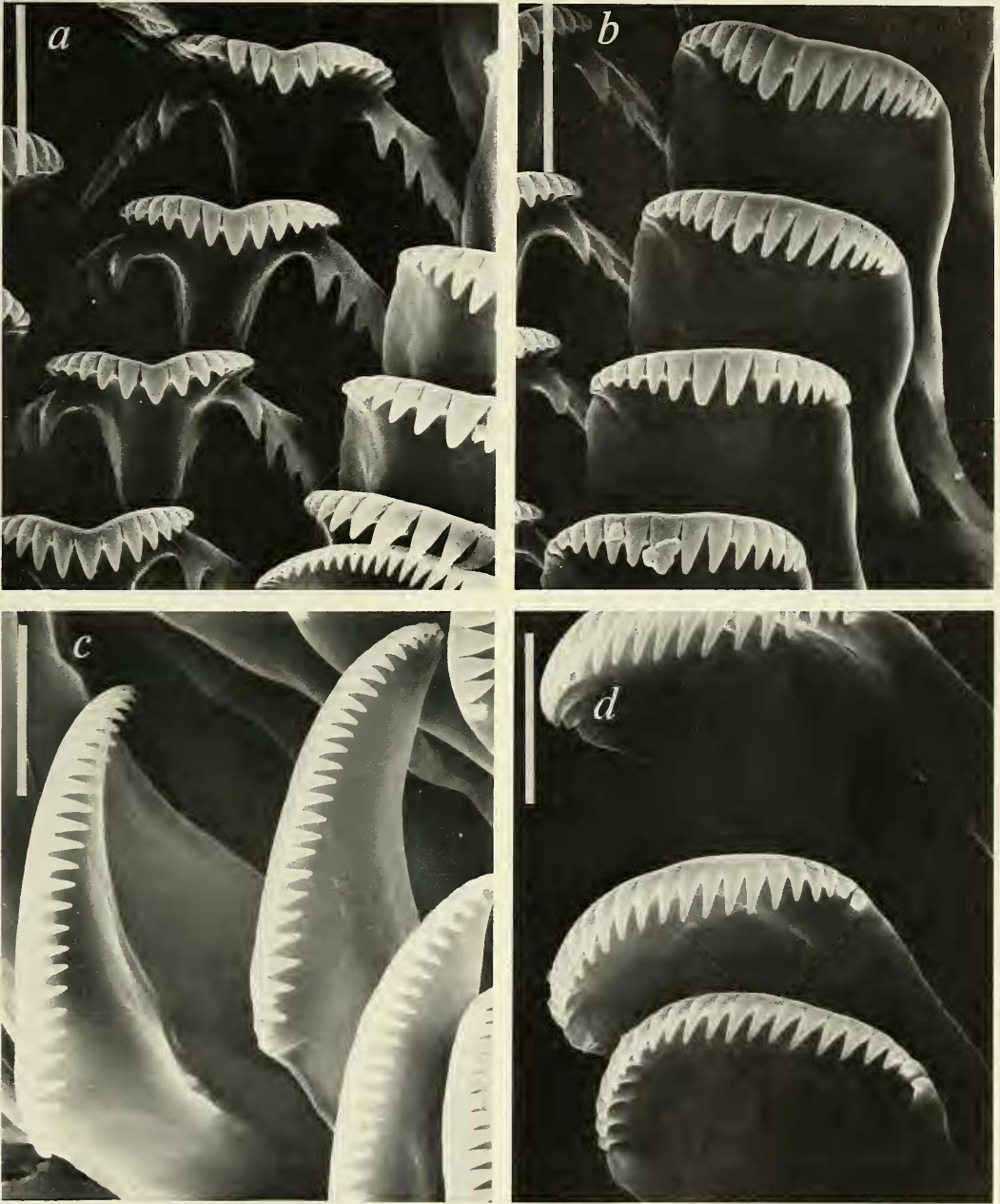


Fig. 8. Radula of *Antrobia culveri* Hubricht, LH coll.: a, Centrals (bar = 7.5 μ m); b, Laterals (bar = 7.5 μ m); c, Inner marginals (bar = 6 μ m); d, Outer marginals (bar = 3.8 μ m).

stream of Tumbling Creek Cave in SE Missouri (Fig. 5). Snails are currently uncommon in the cave (pers. comm. 1986, T. J. Aley, Ozark Underground Laboratory).

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